

# PATENT ABSTRACTS OF JAPAN

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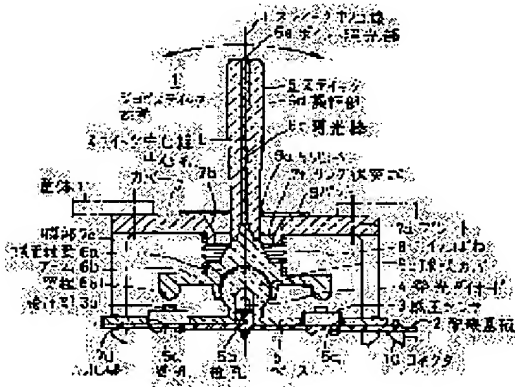
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## (54) JOY STICK DEVICE

### (57)Abstract:

PURPOSE: To obtain information corresponding to not only an operation direction, but also an operation force and also decide whether a joy stick is in operation or a stand-by state.

CONSTITUTION: A light emitting diode 4 which changes in illumination state according to whether the joy stick is in operation or stand-by state is mounted in the center of a substrate 2, and a pressure sensor 3 which varies in resistance value



with a pressing force is mounted at the periphery of the diode. A spherical cover

5c which covers the light emitting diode 4 is projected integrally with a transparent base 5 put over the substrate 2, and the stick 6 is coupled rotatably with it. The stick 6 has its spherical bearings 6a, arms 6b, and light guide bar 6c molded integrally of the same transparent material and further has an opaque operation part 6d molded integrally around the light guide bar 6c. An opaque cover 7 is fitted. A coil spring 8 presses plural arms 6b against the side of the base 5, and consequently the stick center line L is held at right angles to the base 5. The operation part 6d is slanted in a specific direction against the displacing force of the coil spring 8 and the pressure sensor 3 arranged in this direction is pressed by the arm 6b.

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[Claim(s)]

[Claim 1] The light emitting diode to which an illumination condition is changed under operation or according to a standby condition, two or more pressure-sensitive sensors to which resistance is changed according to thrust, and those pressure-sensitive sensors -- a periphery -- meeting -- etc. -- with the wiring substrate which mounted in angle spacing and mounted said light emitting diode in the \*\*\*\* center position of the periphery It is attached in piles on the wiring substrate, and the bore in which said pressure-sensitive sensor and light emitting diode are made to insert is formed. The base where wrap spherical covering protruded the light emitting diode on one from the peripheral wall of the bore in which the light emitting diode is made to insert and which consists of a transparent material, The transparent spherical bearing fitting of the rotation of was made free to the external surface of said spherical covering, and two or more arms which protrude on angles [ one ] spacing and press said pressure-sensitive sensor in the tip section from the side face of the spherical bearing, The light guide rod which it protrudes [ rod ] on one in the direction of a stick center line, and makes the light of said light emitting diode penetrate from the upper limit of said spherical bearing, The stick which has the tubed opaque control unit by which fitting was carried out to the side face of the light guide rod, Opaque covering with which it is attached in said base or a wiring substrate, and has said base and the plate which counters, and the control unit of said stick is projected outside from the feed hole of the plate, It is wound around the surroundings of said spherical bearing, and is pinched between the plate of said covering, and the arm of said stick, and said two or more arms are pressed to said base side. The

coiled spring which holds said stick center line at said base and right angle, The tabular opaque putt which engages with the control unit of said stick, is attached, and takes up the feed hole of said plate, Joy stick equipment it was made to make said pressure-sensitive sensor which provided, and resisted the biased force of said coiled spring, and the tilt of the control unit of said stick was made to carry out in the predetermined direction, and was arranged in the direction press on the tip of said arm.

[Claim 2] Joy stick equipment characterized by said light emitting diode being 2 color light emitting diode in claim 1.

[Claim 3] Joy stick equipment characterized by forming the projection which presses said pressure-sensitive sensor from the edge of the arm of said stick to one in claims 1 or 2.

[Claim 4] Joy stick equipment characterized by being stopped by the engagement hole with which two or more legs protruded on one at said base side, the claw part was formed in the tip of those legs, and the claw part opened said wiring substrate and said base for free passage, and was formed from the circumference of the plate of said covering in claims 1 or 2.

[Claim 5] Joy stick equipment characterized by said sticks being 2 color shaping components (opacity and others being transparence for a control unit) of one in claims 1 or 2.

[Claim 6] Joy stick equipment characterized by for a ring-like projection protruding on one at a base side, and carrying out fitting of the end of said coiled spring to the ring-like projection from the peripheral wall of the feed hole of the plate of said covering in claims 1 or 2.

[Claim 7] Joy stick equipment which the resistor is connected to said wiring substrate at said each pressure-sensitive sensor and serial, and acquired the signal according to an operating physical force from the both node in claims 1 or 2.

[Claim 8] Joy stick equipment characterized by mounting A/D conversion for changing the electrical potential difference of the node of said pressure-sensitive

sensor and resistor into a digital signal in said wiring substrate in claim 7.

[Claim 9] Joy stick equipment characterized by mounting the connector for connecting with said wiring substrate with the exterior in claims 1 or 2.

[Claim 10] Joy stick equipment characterized by the tip of the light guide rod of said stick having projected from the end face of said control unit in claims 1 or 2.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to joy stick equipment equipped with the display for discriminating under operation or a standby condition from the pressure sensor from which resistance changes especially corresponding to the operating physical force of a stick about joy stick equipment.

[0002]

[Description of the Prior Art] Conventional joy stick equipment was the structure of having arranged a microswitch or a leaf switch in the direction (a 2-way, four directions, or eight directions) to which a stick inclines, and making the switch of a direction which inclines switching on and turning off. It can be made to move in the direction which desires an image made into the purpose which operates the switch of these plurality alternatively, for example, the screen projects.

[0003] However, with conventional joy stick equipment, according to the operating physical force of a stick, the target image was not able to be sprung up and migration speed was not able to be changed. That is, there was inconvenience that it could not input to the magnitude of the operating physical force of a stick. Moreover, with the joy stick equipment for the conventional games, there was inconvenience which cannot distinguish under operation or a standby condition.

[0004] In view of such a situation, it succeeds in this invention, and that purpose tends to offer joy stick equipment equipped with the display for distinguishing under operation or a standby condition while the information not only according to the actuation direction but an operating physical force is acquired.

[0005]

[Means for Solving the Problem]

(1) The light emitting diode to which an illumination condition is changed under operation or according to a standby condition, and two or more pressure-sensitive sensors to which resistance is changed according to thrust are used for the joy stick equipment of claim 1. a wiring substrate -- those pressure-sensitive sensors -- a periphery -- meeting -- etc. -- it mounts in angle spacing and light emitting diode is mounted in the \*\*\*\* center position of the periphery.

[0006] The transparent base is attached in piles on the wiring substrate. The bore in which a pressure-sensitive sensor and light emitting diode are made to insert is formed in the base, and wrap spherical covering protrudes the light emitting diode on one from the peripheral wall of the bore in which the light emitting diode is made to insert. A stick is attached in the spherical covering free [ rotation ]. It protrudes on one in the direction of a stick center line from the transparent spherical bearing fitting of the rotation of on the external surface of spherical covering was made free to the stick, two or more arms which protrude on angles [ one ] spacing from the side face of the spherical bearing, and press a pressure-sensitive sensor in the tip section, and the upper limit of spherical bearing, and the tubed opaque control unit by which fitting was carried out is prepared in the side face of the light guide rod which makes the light of light emitting diode penetrate, and its light guide rod.

[0007] Opaque covering is attached in the base or a wiring substrate. The covering has the base and the plate which counters and the control unit of a stick is projected outside from the feed hole of the plate. Coiled spring is wound around the surroundings of spherical bearing, it is pinched between the plate of covering, and the arm of a stick, two or more arms are pressed to a base side, and a stick center line is held at the base and a right angle. Opaque putt engaged with the control unit of a stick, was attached, and has taken up the feed hole of a plate.

[0008] Resist the biased force of coiled spring, the tilt of the control unit of a stick is made to carry out in the predetermined direction, and the pressure-sensitive

sensor arranged in the direction is made to press on the tip of an arm.

(2) Let light emitting diode be 2 color light emitting diode in the above (1) in invention of claim 2.

(3) In invention of claim 3, the projection which presses a pressure-sensitive sensor from the edge of the arm of a stick to one is formed in the above (1) or (2).

[0009] (4) In invention of claim 4, it is stopped in the above (1) or (2) by the engagement hole with which two or more legs protruded on one at the base side, the claw part was formed in the tip of those legs, and the claw part opened a wiring substrate and the base for free passage, and was formed from the circumference of the plate of covering.

(5) Let sticks be 2 color shaping components (for opacity and others to be transparency for a control unit) of one in the above (1) or (2) in invention of claim 5.

[0010] (6) In invention of claim 6, in the above (1) or (2), a ring-like projection protrudes on one at a base side, and fitting of the end of coiled spring is carried out to the ring-like projection from the peripheral wall of the feed hole of the plate of covering.

(7) The resistor is connected to each pressure-sensitive sensor and a serial, and he is trying to acquire the signal according to an operating physical force from the both node to a wiring substrate in the above (1) or (2) in invention of claim 7.

[0011] (8) In invention of claim 8, A/D conversion for changing the electrical potential difference of the node of a pressure-sensitive sensor and a resistor into a digital signal is mounted in the wiring substrate in the above (7).

(9) In invention of claim 9, the connector for connecting with a wiring substrate with the exterior is mounted in the above (1) or (2).

[0012] (10) In invention of claim 10, the tip of the light guide rod of a stick has projected from the end face of a control unit in the above (1) or (2).

[0013]

[Example] The example of this invention is explained with reference to drawing 1

and drawing 2 . the example of (drawing of plurality [ substrate / 2 / wiring ] -- the pressure-sensitive sensor 3 of four-piece) -- a periphery -- meeting -- etc. -- it is mounted in angle spacing and light emitting diode 4 of 2 color luminescence is mounted in the \*\*\*\* center position of the periphery. Because a foreground color was changed [ under operation of this joy stick or ] by whether it is in a standby condition, it considered as the two luminescent color. The pressure-sensitive sensor 3 has pressure-sensitive part 3a in the top-face side, and as resistance shows drawing 3 according to the thrust from the upper part, it changes.

[0014] The base 5 which consists of a transparent material on the wiring substrate 2 is arranged in piles. The bores 5a and 5b in which the pressure-sensitive sensor 3 and light emitting diode 4 are made to insert are formed in the base 5, and wrap spherical covering 5c protrudes light emitting diode 4 on one from the peripheral wall of bore 5b for light emitting diodes. A stick 6 is attached in spherical covering 5c free [ rotation ]. That is, a stick 6 has transparent spherical-bearing 6a, and fitting of the rotation of the spherical-bearing 6a is made free to the external surface of spherical covering 5c. Two or more arm 6b protrudes on angles [ one ] spacing from the side face of spherical-bearing 6a. The projection six b1 which presses a pressure-sensitive sensor is formed in one from the edge of arm 6b. Light guide rod 6c protrudes on one in the direction of the stick center line L from the upper limit of spherical-bearing 6a. This light guide rod 6c is transparent, and makes the light of light emitting diode 4 penetrate to that tip. 6d of tubed opaque control units is fitted in and fixed to the side face of light guide rod 6c. The tip of light guide rod 6c is projected more slightly than the tip of 6d of control units, and is set to point illumination section 6e.

[0015] The opaque covering 7 is attached in the base 5 or the wiring substrate 2. 6d of control units of a stick protrudes outside from feed-hole 7b formed in the base 5 of covering 7, and plate 7a which counters. It is stopped in the example of drawing 1 by the engagement holes 2f and 5f with which two or more leg 7c protruded on one at the base 5 side, 7d of claw parts was formed in the tip of leg



7c, 7d of the claw part opened the wiring substrate 2 and the base 5 for free passage, and it was formed from the circumference of plate 7a.

[0016] Coiled spring 8 is wound around the surroundings of spherical-bearing 6a, and is pinched between plate 7a of covering, and arm 6b of a stick. Coiled spring 8 presses two or more arm 6b to a base 5 side, and holds the stick center line L at the base 5 and a right angle. Fitting of the end of coiled spring 8 is carried out to 7f of ring-like projections which protruded on one from the peripheral wall of feed-hole 7b of a plate at the base side.

[0017] Putt 9 is opaque sheet metal-like product made of synthetic resin, is in the condition to which 6d of control units of a stick fitted into the feed-hole 9a, and is laid on plate 7a. Although the feeling top of beauty is also required for this putt 9, it has the important function to prevent that dust and outdoor daylight enter in covering 7 from feed-hole 7b. What is necessary is to make \*\*\*\* engage with mounting hole 7e of the four corners of plate 7a of covering, or just to make it fix with a bolt and a nut, in order to attach joy stick equipment 1 in a case 11.

[0018] Resist the biased force of coiled spring 8 and the tilt of the 6d of the control units of a stick is made to carry out in the predetermined direction, and if the pressure-sensitive sensor 3 arranged in the direction is pressed by the projection six b1 of an arm, the resistance of a sensor will change according to the thrust. In addition, said stick 6 is realizable with the so-called 2 color shaping components which used the transparent material for 6d of control units at the parts of a nontransparent material and others, and were fabricated by one.

[0019] Although [ old explanation ] the luminescent color of light emitting diode 4 is two colors, this invention may not be restricted in this case, but monochrome is sufficient as it. In that case, what is necessary is to make the light switch on, only when a joy stick comes for example, during operation. The connector 10 for connecting with the wiring substrate 2 through the exterior and a connecting cord is mounted. The schematics of the joy stick equipment 1 of drawing 1 are shown in drawing 4 . If supply voltage +V is supplied to the end of each

pressure-sensitive sensor 3 of joy stick equipment 1 and the other end is connected to a common potential point through Resistor R as shown in drawing 5 , the electrical potential difference of the magnitude corresponding to thrust will be obtained from the node of each pressure-sensitive sensor 3 and Resistor R. This electrical potential difference may be changed into a digital signal by A/D-converter AD. The circuit which includes these Resistors R and A/D-converter AD depending on the case may be mounted in the wiring substrate 2.

[0020]

[Effect of the Invention] In this invention, instead of a conventional microswitch or a conventional leaf switch, since it used pressure-sensitive sensor 3, the information according to an operating physical force which carries out a resistance value change according to thrust can be acquired. Moreover, since light emitting diode is mounted and it enabled it to illuminate point illumination section 6e at the tip of a stick 6 with that light, under operation of this joy stick or a standby condition can be distinguished at a glance by switch of that luminescent color, or lighting/putting out lights.

[Brief Description of the Drawings]

[Drawing 1] Drawing of longitudinal section showing the example of this invention.

[Drawing 2] The partial decomposition perspective view of the example of drawing 1 .

[Drawing 3] The graph which shows the resistance counter pressure force property of the pressure-sensitive sensor 3 of drawing 1 .

[Drawing 4] Schematics showing an example of the wiring substrate 2 of drawing 1 .

[Drawing 5] Other schematics of the wiring substrate 2 of drawing 1 .